

REMARKS

In response to the Office Action dated March 2, 2009, claims 1 and 15 have been amended. Claims 1-16 remain active in this application. No new matter has been added. Claims 1 and 15 are independent claims.

Claims 1-11 and 13-16 were rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the enablement requirement. The Examiner asserted that claims 1 and 15 recite an electron concentration of the first diamond semiconductor exhibits a negative correlation with temperature, in a temperature range having a width of 100° C or more and included within a temperature region from 0° C to 300° C. The Examiner concluded that this limitation is a property of the device and the disclosure does not support this limitation and does not enable one of ordinary skill in the art to make or use such an invention. Applicants respectfully traverse.

The Supreme Court set the standard for determining whether the specification meets the enablement requirement. That standard is whether undue experimentation is needed to practice the invention. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916); *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404, (Fed. Cir. 1988); MPEP 2164.01. Applicant submits that in light of the instant disclosure, one of ordinary skill in this art would be able to practice the invention. There are many factors that must be considered when reaching a conclusion of lack of enablement. These factors include:

- (A) The breadth of the claims;
- (B) The nature of the invention;
- (C) The state of the prior art;
- (D) The level of one of ordinary skill;

- (E) The level of predictability in the art;
- (F) The amount of direction provided by the inventor;
- (G) The existence of working examples; and
- (H) The quantity of experimentation needed to make or use the invention based on the

content of the disclosure. *Wands*, 858 F.2d at 737; 8 USPQ2d at 1404.

The Examiner's analysis of enablement must consider all the evidence related to each of these factors. Focusing on one or only several of the factors is not sufficient to determine whether an invention is not enabled. MPEP § 2164.01(a). There is no indication in the Office Action that the Examiner considered the all of the above factors in reaching the conclusion of lack of enablement. The rejection is not legally viable for at least this reason.

In order to make a rejection for lack of enablement, the Examiner has the initial burden to establish a reasonable basis to question the enablement provided for the claimed invention. *In re Wright*, 999 F.2d 1557, 1562, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993); MPEP § 2164.04. The Examiner must provide a reason as to why the scope of protection provided by a claim is not adequately enabled by the disclosure. A specification disclosure which contains a teaching of the manner and process of making and using an invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented must be relied on for enabling support. *See In re Marzocchi*, 439 F.2d 220, 224, 169 USPQ 367, 370 (C.C.P.A. 1971); MPEP § 2164.04. Applicants submit that one of ordinary skill in this art would know how to make and use the inventions of claims 1 and 15 in light of the instant disclosure. The Examiner has not shown that the inventions of claim 1 and 15 are not enabled for one of ordinary skill in this art. Applicants submit that claims 1 and 15 fully comport with the requirements of 35 U.S.C. § 112, first paragraph.

The present supporting specification describes, in paragraph [0037] at page 17, that the property in each of claims 1 and 15, which is identified by Examiner, is one of the claimed first diamond semiconductor (first diamond semiconductor layer 12) that constitutes a part of a diamond n-type semiconductor. In other words, the property such as “an electron concentration negatively correlated with temperature in a temperature range” can be realized by only the claimed first diamond semiconductor, and such a property can be improved by the combination of the claimed first and second diamond semiconductors. Structurally, such a property can be realized by adjusting the n-type dopant concentration in the claimed first diamond semiconductor, and the adjustment of n-type dopant can be performed by vapor-phase synthesis (growth). See also [0039].

The Examiner has failed to explain how or why one of ordinary skill in material science in semiconductor processing art would not be able to adjust the concentration of n-type dopant during vapor-phase synthesis (growth). “Detailed procedures for making and using the invention may not be necessary if the description of the invention itself is sufficient to permit those skilled in the art to make and use the invention.” MPEP § 2164. As explained above, the Examiner must prove that the invention does not meet the enablement requirement. As the Examiner has not met the burden of proving the invention is not enabled, Applicants submit that the rejection under 35 U.S.C. § 112 should be withdrawn.

Claims 1-6, 8, 11 and 13 were rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Imai et al. (U.S. Pat. No. 5,001,452, hereinafter “Imai”), or in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over Imai. Applicants respectfully traverse the rejection.

Dependent claim 7 was rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Imai in view of Hasegawa et al. (U.S. Patent App. Pub. No. 2002/0127405). Applicants respectfully traverse.

Claims 9, 14 and 15 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Imai in view of Yoshida (U.S. Pat. No. 6,340,393, hereinafter “Yoshida”). Applicants respectfully traverse.

Claims 10 and 16 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Imai in view of Yoshida and further in view of Hasegawa. Applicants respectfully traverse.

Claim 12 was rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Imai in view of Shiomi et al. (U.S. Pat. No. 5,252,849, hereinafter “Shiomi”). Applicants respectfully traverse.

By the above amendment, the claimed subject matter is directed to a diamond n-type semiconductor and a manufacturing method thereof characterized by a diamond semiconductor which has a n-type conductivity and in which distortion is artificially formed. Such a claimed structure cannot be realized even if Imai, Hasegawa, Yoshida and Shiomi are combined as suggested by the Examiner.

Firstly, regarding the novelty rejection of independent claim 1, based on the Imai patent, Applicants submit that Imai teaches, at col. 3, lines 57-61, that there is a case that sulfur causes a Frenkel defect, and this may also serve to create a donor level. However, this section of Imai does not support the Examiner’s assertion at page 3 of the Office Action that “a distortion may be formed in the lattice due to the impurity”. The Examiner’s apparent reliance on the doctrine of inherency is misplaced. Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient to

establish inherency. *In re Rijckaert*, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 212 USPQ 323, (CCPA 1981). To establish inherency, the extrinsic evidence must make clear that the missing property (i.e. a distortion) must necessarily be present in the thing described in the reference. The Examiner's has not cited to any specific section of Imai that would support the conclusion that a distortion exists in the diamond n-type semiconductor, much less that the distortion would be artificially formed, as required in amended claim 1. A prima facie case of anticipation or obviousness has not been established. The rejection is not legally viable and should be withdrawn.

With respect to the rejection of independent claim 15, the Examiner relied on the combined teachings of Imai and Yoshida. Applicants incorporate their previous arguments with respect to Imai. The secondary reference to Yoshida teaches, at col. 2, beginning at line 52, that "by simultaneously doping a p-type dopant and an n-type dopant, it becomes possible to stabilize an n-type dopant in a high density, lower an impurity level and greatly increase the number of carriers, to thereby synthesize a high quality single crystal diamond thin film having low resistance". However, as can be seen from the definition that the present claimed first diamond semiconductor has an n-type conductivity and a distortion in its crystal, it is clear that the object of the present claimed subject matter is not to form a high quality single crystal diamond, as with the Yoshida patent. In other words, Yoshida teaches away from the artificial formation of a distortion. Thus, the rejection is not legally viable since the combined references fail to disclose or suggest every limitation of claim 15.

Moreover, regarding the rejection of dependent claims 10 and 16 predicated upon the combination of Imai, Yoshida and Hasegawa, Applicants offer the following remarks. In the Office Action, the Examiner indicates that “Yoshida discloses combining a second impurity element together with the donor element in a diamond semiconductor (page 8, lines 13-14)”. However, it is Applicants’ position that Yoshida teaches the introduction of donor and acceptor elements combined to each other into a diamond semiconductor.

Furthermore, Hasegawa teaches at paragraph [0037], that “[i]n fabricating p-type diamond semiconductors, boron (Group III), silicon (Group IV) and the like can be used as the dopant elements”, and also teaches “this is a case when fabricated by an ion implantation method” See paragraph [0037]. On the other hand, the attached document entitled “NEW DIAMOND” teaches, at page 15, that a diamond thin film, in which silicon is doped by vapor-phase synthesis, becomes a n-type semiconductor. Namely, silicon acts as a donor element in vapor-phase synthesis process. In addition, the attached second document entitled “Physics of Semiconductor Devices” describes, at page 21, that carbon acts as a donor element when carbon is doped into silicon. When considering such a description, it can be inferred that, at the time of doping one Group IV element into a different Group IV element, the doped Group IV element acts as a donor element in the different Group IV element. Therefore, there is reason to believe that silicon doped into carbon (namely diamond) acts as a donor element.

As such, despite that Yoshida teaches a donor-acceptor combination together with public knowledge that silicon is a donor element, Applicants submit that it would have been obvious to achieve a structure wherein one donor element is doped into a different donor element by using vapor-phase synthesis, since the structure of the present claimed subject matter which is directed to a combination of donor elements is not known or taught by the prior art.

In addition, dependent claims 9 and 10, disclose that silicon (impurity) is an element other than a donor element. These dependent claims are directed to a novel concept where electrons or holes are not generated, namely silicon carbide locally exists in a diamond, even if one Group IV element is doped into a different Group IV element, while ignoring the foregoing public knowledge that teaches the silicon becomes a donor element.

Under Federal Circuit guidelines, a dependent claim is allowable if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Thus, as independent claims 1 and 15 are allowable for the reasons set forth above, it is respectfully submitted that dependent claims 2-14 and 16 are allowable for at least the same reasons as their respective base claims.

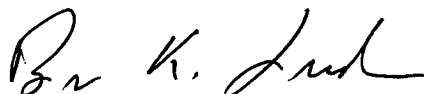
Accordingly, it is urged that the application, as now amended, is in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, Examiner is requested to call the undersigned attorney at the telephone number shown below.

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To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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